

**HISTORICAL VEGETATION IN REGION ONE BY CLIMATIC
SECTION**

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INTRODUCTION

One of the underlying needs in implementing Ecosystem Management is an understanding of natural processes and the variability in vegetative structure that would have been present on our landscapes as a result of those processes. This need was recognized at the beginning of the Ecosystem Management Project initiated by the Northern Region in 1992. As a result two specific projects were undertaken to address this issue. A search of the historical literature to describe the "natural" vegetation structure and a study to describe the fire regimes associated with this structure. While many debates have raged about the term "natural" I have taken a very simplistic approach and use the term to represent the vegetation present at the time that significant numbers of Euroamericans settled the area. That this structure was at least somewhat stable can be documented with fire history investigations and bog analysis.

This paper is not complete in either its coverage of the vegetation or the other biota associated with the Regional landscape. For the vegetation portion the sources of information have only been partially investigated. This is particularly true for the grassland types in the eastern portion of the Region and to some extent the forested types. Efforts are ongoing to fill these voids and a more complete report should be available after the current field season. Other members will contribute information for other biota and by the end of the project an integrated assessment of the Region should exist. To date the focus for investigation has been the area bounded by the Northern Region boundaries. This coverage will eventually be expanded to include all the area within the ecosystems associated with the Northern Rocky Mountains including Canada. The role fire played in developing our vegetative structure or fire regimes will be presented in another paper.

A map depicting historical vegetation in Region One has been developed. Information for forested areas in northern Idaho was taken from the timber surveys conducted during the 1930's. Grassland types were described following Kuchler (1964). Montana cover types were based on Morris (1964) and supplemented with information from the timber surveys, Kuchler (1964) and Ross (1976). North and South Dakota are based on Kuchler.

Specific information for forest cover types was obtained from the 1930's timber inventory for northern Idaho, western Montana and portions of eastern Montana. Survey level data from the 1940's was used for the remaining portion of eastern Montana. In most cases types described in these inventories followed those shown on the map. Minor types such as western redcedar, western redcedar-fir, western hemlock-fir and cottonwood were the exception. These types were limited and at the level of detail used in past mapping efforts were not of sufficient size to be mapped separately. Generally these types were found in narrow strips in riparian areas or moist benches or slopes. Unless otherwise stated age conditions presented in the discussion reflect the expected stand conditions in 1900. Area of the various cover types generally reflect the 1930's conditions.

The following descriptions provide definitions for the cover types as defined in the 1930's inventory and a general discussion of the modal type. When characterizing species composition of the various cover types, only species which represented more than 10

percent of the stand volume were included. Specific age and structure or departures from this model type are described in each Climatic Section.

Western white pine - Stands containing 15 percent or more of net cubic volume of white pine. This type was given priority over all other types. The heart of the white pine cover type was in north Idaho with some occurring in northwest Montana and northeastern Washington. The definition for this type permits a wide variety of conditions to be present. White pine generally made up more than a third of the stand volume however other tree species were more variable and any one species probably did not exceed 20 percent of the volume. Common associates were Douglas-fir, larch and grand fir with variable amounts of spruce, redcedar and hemlock. The type was commonly found on all but high energy slopes or upper subalpine environments. Stands tended to be dense with multi-layers common.

Ponderosa pine - Stands containing 25 percent or more of ponderosa pine. This cover type was normally restricted to broad valley bottoms or lower to mid slopes on high energy aspects. On portions of the type ponderosa pine formed almost pure stands. This was most common in the southern portion of Idaho and south central and eastern Montana where 50 percent of the type may have been in pure stands. In the extreme northern portion pure stands were found on less than 10 percent of the type. On stands that had mixed species ponderosa pine accounted for over 50 percent of the volume. Douglas-fir was present in significant amounts normally representing 20 percent or more of the stand. Larch was also a major component within its range. Stands commonly were very open with trees often grouped by age. Mature trees dominated most stands with savannah conditions common on the driest sites.

Larch-Douglas-fir - Stands containing 10 percent or more of larch and 75 percent of larch and Douglas-fir combined. The optimum development of this type occurred in northwestern Montana particularly around the Kalispell area and Swan and Clearwater valleys. The type was found on slightly drier sites than the white pine type and fewer species were present. Larch was the dominant species usually accounting for an average of 64 percent of the stand volume. Douglas-fir was also a significant species and normally accounted for 28 percent of the volume. Stands in Montana were dominated by larch with an average of 72 percent of the volume while in Idaho it accounted for about 41 percent. Douglas-fir was more common in Idaho accounting for 33 percent of the volume while in Montana it made up 26 percent. Occasionally grand fir in Idaho and Engelmann spruce in Montana exceeded 10 percent of the volume. While lodgepole pine was commonly associated with the larch type particularly in Montana it was typically young in age and did not account for a significant part of the stand volume. Stand structure varied by topographical position. Open grown stands of almost pure mature larch were common in the larger valley bottoms while stand structure was highly variable in age and composition on other sites.

Douglas-fir - Stands containing 60 percent or more of Douglas-fir and less than 10 percent of larch. The Douglas-fir type exhibited its best development in the cooler, drier parts of western Montana and northern Idaho and the warmer slopes in eastern Montana. It was commonly found on various aspects from low to upper slopes. Sites were normally dominated by Douglas-fir with it accounting for almost 75 percent of the volume. On high ridge lines or high energy slopes, stands were typically mature and open grown with a limited understory. Cooler north slopes were generally dense younger aged stands. Grand fir was a cohort within its range representing about 13 percent of the volume in Idaho. Ponderosa pine and larch were a minor component. Occasionally lodgepole pine made up more than 10 percent of the stand volume in Montana but was only a limited species in Idaho.

Engelmann spruce - Stands containing 50 percent or more of Engelmann spruce. The Engelmann spruce cover type was associated with the white pine types of north Idaho and northwest Montana. It was also a common type found in moist areas in eastern Montana.

While not representing a significant portion of any Section it was common in riparian zones and high basins. Stands contained greater than 60 percent Engelmann spruce with grand fir the only other species of importance in the western portion of the type. Occasionally larch, Douglas-fir or white pine contributed more than 10 percent of the volume. In eastern Montana lodgepole pine or occasionally subalpine fir were found in the type.

Lodgepole pine - Stands containing 50 percent or more of lodgepole pine. The type was common through out the Region particularly in the southern portion of north portion of Idaho and Montana and in eastern Montana. Stands were normally confined to the mid to upper slopes on all aspects normally in the drier environments. A wide variety of species could be cohorts and varied depending on climatic conditions. Grand fir, Engelmann spruce, and Douglas-fir were the most common associates along with white pine and larch. Of interest is the lack of significant amounts of subalpine fir during the 1900 time period. Stands were commonly dense with a great deal of deadfall and normally immature or younger in age. Occasionally mature stands were found particularly on gentle topography or areas that were sheltered from major wind events.

Western redcedar - Stands in which western redcedar predominates. The redcedar type represents only minor amounts of the Region. The major area of the type was found in Climatic Sections 8 and 9 where it occurred in the riparian zone of major wooded valley bottoms. Cedar normally dominated these locations with it representing greater than 60 percent of the volume. Occasionally western hemlock or grand fir represented greater than 10 percent of the volume. Stands commonly had limited ground vegetation with most stands well past maturity.

Western redcedar-grand fir - Stands in which western redcedar and grand fir predominate. Although of limited area, this type like the redcedar type was an important riparian vegetation type. It was also found on benches and moist slopes outside of the riparian area usually growing on optimum sites for tree growth. Either redcedar or grand fir were the dominant species with cedar always present and grand fir usually present in the stand. These two species usually represented 70 percent of the stand volume. Other species that may have been present were spruce, Douglas-fir, and occasionally western hemlock or larch. Stands commonly were dense with multi-layres. A variety of aged stands were commonly found.

Hemlock-grand fir - Stands in which 50 percent or more was hemlock and/or grand fir. This type was found in the same general conditions as the redcedar-grand fir type although temperatures may have been slightly warmer. Stand composition appeared to vary from stands dominated by hemlock to stands with 4 species that contain more than 10 percent of the volume. Hemlock and grand fir represented at least 50 percent of stand volume with varying amounts of Douglas-fir, redcedar, spruce and occasionally larch. Stand age and structure was similar to the western redcedar-fir type.

TABLE 1 - PERCENT AREA BY COVER TYPE FOR ALL ACRES BY COUNTY IN IDAHO AND MONTANA - 1930's

NORTHERN IDAHO

COUNTY	WWP*	PP	L-DF	H-WF	DF	ES	LP	WRC	C-WF	SALP	NCF	NF
Benewah	35.3	22.5	12.8	0.6	0.9	0	1.8	1.0	1.7	0.6	5.9	16.9
Bonner	33.4	15.2	21.6	0.2	1.6	0.9	2.5	0.8	0.6	8.1	8.4	6.7
Boundary	24.6	10.0	17.7	0.3	1.2	6.3	5.4	1.2	0.2	21.5	4.5	7.1

Clearwater	49.4	6.5	7.2	1.2	1.8	0.9	5.6	0.6	2.6	9.4	10.6	4.2
Idaho	1.6	13.8	4.2	3.5	12.4	3.6	16.0	0.4	3.2	16.6	7.4	17.3
Kootenai	20.8	24.3	18.8	0.8	4.2	T	2.4	T	0.6	1.3	7.0	19.8
Latah	20.1	20.1	11.9	0.5	0.3	0	0.6	T	1.5	0	2.6	42.4
Shoshone	53.7	3.1	8.4	0.9	4.3	1.9	6.1	0.2	0.5	10.0	9.9	1.0
Nez Perce	0	15.3	2.3	0.3	0.6	0	0.8	0	0	0	1.1	79.6
Lewis	0	22.3	0.8	0	2.7	0	0.2	0	0	0	1.0	73.0
TOT N.Ida	22.4	13.0	9.1	1.7	5.9	2.1	8.1	0.4	1.8	10.7	7.3	17.5

WESTERN MONTANA

COUNTY	WWP*	PP	L-DF	H-WF	DF	ES	LP	WRC	C-WF	SALP	NCF	NF
Deerlodge**	0	0	0	0	2.5	0.2	24.7	0	0	1.7	19.6	51.3
Flathead	1.0	4.5	21.9	0.1	1.1	4.5	13.5	T	0	16.4	25.8	11.2
Granite**	0	4.2	0.3	0	19.2	0.7	34.0	0	0	9.0	6.2	26.4
Lake	1.4	17.6	17.4	0	0.4	4.3	4.3	0.1	0	2.5	8.5	43.5
Lew&Clark**	0	5.6	0	0	15.3	0.9	28.6	0	0	17.3	21.0	11.3
Lincoln	5.2	14.8	35.0	T	1.0	4.2	15.4	0.3	0.2	14.0	6.7	3.2
Mineral	2.5	31.0	25.0	0.2	1.2	0.3	6.9	T	0.2	13.3	17.4	2.0
Missoula	0.2	24.0	22.8	T	5.1	2.7	13.9	T	0	6.1	13.1	12.1
Powell	0	5.5	3.9	0	11.6	0.2	14.1	0	0	16.3	13.0	35.4
Ravalli	0	17.9	0.7	0	9.0	0.3	6.5	0	0	25.5	21.0	19.1
Sanders	6.8	24.5	21.8	0.2	1.7	0.1	3.2	0.1	0.1	7.5	16.1	17.9
Silverbow**	0	0	0	0	10.9	0.1	23.8	0	0	0.9	8.9	55.4
W Montana	2.0	13.7	17.3	0.1	5.1	2.3	13.4	0.1	T	12.9	15.5	17.6

N Idaho

W Montana 11.0 13.4 13.7 0.8 5.5 2.2 11.1 0.2 0.8 11.9 11.9 17.5 **CENTRAL**

MONTANA(portion only)

COUNTY	WWP*	PP	L-DF	H-WF	DF	ES	LP	WRC	C-WF	SALP	NCF	NF
CHOUTEAU	0	0.5	0	0	0.5	0	0.6	0	0	0	0.8	97.6
FERGUS	0	10.3	0	0	0.6	T	0.6	0	0	0	3.0	85.5
JUTH BASIN	0	2.5	0	0	7.2	0.1	7.1	0	0	0	7.9	75.2
Cen Montana	0	5.1	0	0	1.8	T	1.8	0	0	0	3.1	88.2
Total Area	9.0	11.8	11.1	0.6	4.8	1.8	9.3	0.2	0.7	9.7	10.2	30.8

- Cover type codes:

WWP - Western White Pine

PP - Ponderosa Pine

L-DF - Larch-Douglas-fir

H-WF - Western Hemlock-White Fir (grand fir)

DF - Douglas-fir

ES - Engelmann Spruce

LP - Lodgepole Pine

WRC - Western Red Cedar

C-WF - Western Red Cedar-White Fir (grand fir)

ALP - Alpine (Above commercial Forest)

NCF - Non Commercial Forest - Rocky, plus deforested cutover, nonstocked burn

NF - Non Forest - Barren, Grass, Brush, Other

** West of the Continental Divide only

TABLE 2 - AVERAGE VOLUME PER ACRE BY COVER TYPE FOR COUNTIES IN

IDAHO AND MONTANA (ALL ACRES) - 1930's

COUNTY	WWP	PP	L-DF	H-WF	DF	ES	LP	WRC	C-WF	AVG
Benewah	15.8	10.1	9.2	6.2	5.8	0	7.3	7.4	18.1	12.2
Bonner	15.7	7.2	7.0	9.9	6.2	9.1	6.8	20.2	9.2	12.2
Boundary	16.0	6.8	6.8	10.7	5.5	11.7	8.9	32.9	17.6	12.8
Clearwater	21.5	9.8	9.8	10.4	10.7	15.4	7.8	16.6	13.8	17.9
Idaho	15.1	10.1	11.2	9.8	7.8	11.3	5.6	23.2	10.6	10.1
Kootenai	16.4	8.8	10.4	15.5	7.0	0	5.2	0	7.8	12.7
Latah	15.2	9.1	7.9	7.6	7.8	0	0	6.0	9.1	9.9
Shoshone	17.2	9.8	11.4	11.6	10.7	13.0	6.7	12.8	11.2	15.0
N. Idaho	18.5	9.6	9.7	10.1	8.3	11.8	6.1	21.6	11.6	13.0
Deerlodge	0	0	0	0	3.3	4.5	3.4	0	0	3.6
Flathead	12.0	11.0	9.1	9.5	6.6	12.2	4.8	17.0	0	9.7
Granite	0	5.0	7.6	0	5.5	5.5	3.8	0	0	5.2
Lake	11.8	6.7	7.8	0	4.3	7.9	4.0	9.3	0	7.6
Lewis&Clark	0	6.6	0	0	4.8	7.3	3.9	0	0	5.5
Lincoln	16.3	9.8	9.1	9.0	7.0	14.6	5.0	14.2	10.8	10.4
Mineral	10.1	6.1	7.0	0	5.4	12.7	4.8	13.5	7.6	6.7
Missoula	13.0	6.4	7.6	0	5.7	7.9	4.9	8.7	0	7.0
Powell	0	6.1	7.2	0	4.7	7.1	3.3	0	0	5.9
Ravalli	0	7.5	6.1	0	6.0	7.8	3.2	0	0	7.2
Sanders	13.8	8.0	7.5	12.5	6.6	15.4	11.0	13.3	8.3	8.2
Silverbow	0	0	0	0	4.0	0	3.1	0	0	3.3
W. Montana	13.9	7.8	8.5	11.0	5.6	11.6	4.6	13.1	9.7	8.5
Idaho & Montana	18.0	8.5	8.8	10.1	7.2	11.7	5.1	20.5	11.6	10.6

TABLE 3 - PERCENT ACRES BY AGE CLASS BY COVER TYPE FOR NATIONAL FOREST LAND IN IDAHO AND MONTANA - 1900

COVER TYPE	NON STOCKED	SEEDINGS & SAPLINGS 1-40 YRS	POLES 41-60 YRS	IMMATURE 61-100 YRS	MATURE 101-VAR.YRS	POTENTIAL OLD GROWTH 121+*YRS
W.White Pine	18.4	21.9	4.2	13.5	12.1	29.8
Ponderosa P	12.5	8.0	1.7	5.7	26.6	45.5
Larch- Douglas-Fir	20.7	28.5	6.2	9.7	15.0	19.9
Hemlock- White Fir	3.0	7.1	2.5	7.5	28.5	51.5
Douglas-Fir	39.4	17.3	5.7	12.9	17.6	7.1
Engelmann Spruce	11.9	11.2	2.5	10.3	23.0	41.2
Lodgepole P	31.9	44.5	6.8	9.4	4.0	3.5
W.Red Cedar	2.5	3.6	1.3	6.2	6.2	80.7
Cedar- White Fir	21.6	15.3	6.4	13.1	25.1	18.4
N. Idaho	21.1	22.2	4.6	11.3	15.0	25.8

W.White Pine	22.8	23.2	3.8	6.8	22.5	20.8
Ponderosa P	8.4	9.8	6.2	5.0	16.1	54.4
Larch-						
Douglas-Fir	18.2	19.1	5.9	7.3	18.2	31.3
Hemlock-						
White Fir	1.9	12.6	23.1	0	24.6	37.7
Douglas-Fir	4.8	22.8	8.5	23.5	33.4	6.9
Engelman						
Spruce	2.8	3.9	1.6	4.8	41.9	45.1
Lodgepole P	17.5	38.6	11.4	20.5	9.3	2.7
W.Red Cedar	11.4	10.6	0.7	9.6	5.8	61.8
Cedar-						
White Fir	8.6	17.6	27.3	6.9	10.2	29.5
W. Montana	14.6	23.7	7.6	12.6	18.0	23.4
Idaho &						
Montana	17.4	23.1	6.4	12.0	16.7	24.4

* Potential Old Growth minimum age using 1991 Region One draft definitions:

	PP,DF,L	LP	OTHER
W. Mont	171+	141+	181+
N. Ida	151+	121+	161+

CLIMATIC SECTIONS

The age structure presented in the Climatic Sections is generally based on information from the 1930's timber inventory. Only Forest Service lands were evaluated in this analysis because of the cutting activity on private land which distorted its age structure. Age classes were adjusted to represent 1900 conditions which generally would reflect stand conditions at the time of Euroamerican arrival.

An attempt was made to determine the percentage of stands that could have qualified as old growth. The Region One draft definitions were used to screen the data however factors such as tree size, tree number, and other stand attributes could not be evaluated. The percentage figures therefore represent all potential acres and the actual area could have been significantly less.

Grass types are more difficult to describe. Not only were they subjected to heavy grazing pressure very early in the settlement period which has left few undisturbed sites for reference but they are naturally highly variable which makes it difficult to quantify vegetation structure. Information is presented by major cover types and where available more site specific information is included. Additional information will be added in subsequent drafts.

CLIMATIC SECTION 1 - PRIEST

The zone is primarily west of Region One with only a minor section found in northern Idaho. It lies west of Priest River and Priest Lake from Sandpoint to the Canadian line. It covers a portion of the Kaniksu and Kootenai Forests in Boundary and Bonner counties and includes a portion of the Purcell Mountains.

The climate is under the Pacific Maritime influence with precipitation ranging from 30 to 70 inches. A variety of landforms occur in the area with glacial activity evident in moraines and deposition areas. Granitic and belts slopes and rolling hills are also present. Winters are not particularly severe but snowfall is heavy. Adequate soil moisture is generally present during the growing season on all but the most severe sites.

The historical development for the portion in Montana followed that associated with Climatic Section 9.

Currently data is only available for the Idaho portion. Subsequent drafts will include the Washington portion. About 98 percent of the area supported forested communities with 60 percent of the area in the white pine type and 28 percent in the larch-Douglas-fir type. The remaining 10 percent was made up of minor amounts of the other cover types including lodgepole pine, ponderosa pine and spruce-fir types. Most of the area is Forest Service ownership and data from Climatic Section 8 probably will provide a good description of the age structure of the cover types encountered. Significant portions of the area were burned during 1926 and to a lesser extent in 1909.

CLIMATIC SECTION 2 - SPOKANE

Like area 1 this zone is more common in Washington and represents only a minor portion of Region One. It is primarily in non Forest Service ownership. The area lies south of Newport to the Purcell Trench and along the west side of Lake Coeur d'Alene to Hangman Creek and includes a portion of Bonner, Kootenai and Benewah Counties.

Climatic conditions represent a transition from the Palouse grasslands in Washington to the forested types in Idaho. Precipitation varies from 20 inches in some of the major valleys to about 60 inches on the higher points. Temperatures are somewhat warmer than Section 1. The mountain slopes are formed from the Belt rock group with the major valleys filled with glacial deposition.

The historical development for the portion in Montana followed that associated with Climatic Section 8.

In Idaho forested cover types occupy about 78 percent of the Section. Ponderosa pine was the major cover type (59 percent) with larch-Douglas-fir found on 11 percent and white pine and a minor amount of lodgepole pine on the remaining 8 percent. Climatic Section 8 provides an approximation of the historical stand structure. Specific cover type information for the portion of the type in Washington will be included in subsequent drafts.

The non forest portion represents 22 percent of the area and was dominated by the wheatgrass-fescue cover type. It was primarily a dense, low to medium tall grassland with bluebunch wheatgrass and Idaho fescue the dominant species. A number of common forbs such as yarrow, paintbrush, lupine, hawkweed and cinquefoil were present. Three tipped sagebrush was the most common shrub with rose and snowberry also present.

CLIMATIC SECTION 3 - PALUSE

This climatic type occupies a small area north of the Clearwater River, south of the Palouse Range and the area around Potlach. Only a minor amount of Forest Service land is found in the unit. The area is predominately found in Latah County with only a minor amount in Nez Perce county. The Section extends into Washington however information has not been analyzed for this portion to date.

The area is significantly drier and warmer than Climatic Section 8 and the Palouse grassland occupies a majority of the Section. Precipitation averages about 20 to 30 inches per year. The topography is one of rolling hills and stream breaklands on basalt.

The area around Moscow was settled about 1871 with a sawmill established in 1876. Small sawmills were common with 13 present in 1910. The large mill at Potlach was started in 1906 resulting in major impacts on the forested communities.

Forested Types (30 percent)

Ponderosa pine - About 29 percent of the Climatic Area contained ponderosa pine. Using County figures for 1938 about 38 percent was shown as sawtimber, 48 percent as poles and 12 percent as seedling and sapling. The remaining 2 percent was recent burns and cutover areas. About 51 percent may have been old growth and 2 percent was under 40 years of age in 1900. These values were based on Forest Service land in Latah county which is generally in Climatic Section 8.

Minor amounts of other types accounted for about 1 percent of the area with larch-Douglas-fir the most common type. Riparian areas contained minor amounts of moist cover types such as Engelmann spruce.

Grassland Types (70 percent)

Wheatgrass-fescue - Over 70 percent of the Climatic Section was in grass types. This was a dense, low to medium tall grassland with bluebunch wheatgrass and Idaho fescue the dominant species. A number of common forbs such as yarrow, paintbrush, lupine, hawkweed and cinquefoil were present. Three tipped sagebrush was the most common shrub with rose and snowberry also present.

Specific age structure information is currently not available for the major portion of the type in Washington, however, Climatic Section 8 provides an approximation of the historical stand structure on the forested acres for Idaho.

CLIMATIC SECTION 4 - SNAKE-SALMON

A small area west of Grangeville to Riggins and the south slopes into the Salmon river to Waugh Mountain on the Nez Perce Forest is designated Climatic Section 4. About one third of the area is Forest Service land principally along the Salmon River and includes portions of the Nez Perce and Bitterroot Forests. The area is primarily in Idaho County with only a minor amount of Nez Perce and Lewis County included. The Section extends into Washington and Oregon but information is currently not available for this portion of the area.

The area is significantly drier and warmer than Climatic Section 8 and a significant portion is covered by the Palouse grassland or open grown ponderosa pine stands. Precipitation ranges from 10 to 40 inches a year. Landforms are primarily breaklands in a variety of bedrock with a minor amount of basalt uplands on a slightly cooler and moister environment.

Settlement in the Grangeville area began about 1861 but was limited until about 1900. A few small sawmills were present to provide lumber for local construction.

Forested Types (47 percent)

Ponderosa pine - This type accounted for about 33 percent of the Climatic Section. County figures on stand structure may be misleading for this area because of the large and diverse nature of Idaho County and logging on private lands in the other two counties. Mature and old growth stands probably accounted for between 39 and 80 percent of the stands and stands less than 40 years of age accounted for between 13 and 34 percent. These stands would have been open grown essentially pure ponderosa pine.

Other forest types - The remaining forested portion of the area included a mixture of types and accounted for about 14 percent of the unit. Lodgepole pine (5 percent), subalpine (8 percent) and larch-Douglas-fir (1 percent) types were the most common. Minor amounts of riparian cover types would have been found associated with major drainages. Stand structure for these types was similar to Climatic Section 6.

Grassland Types (53 percent)

Wheatgrass-bluegrass - Primarily a dense, low to medium tall grassland dominated by bluebunch wheatgrass with Sandburg bluegrass an important secondary species. It is considered a moderately arid grassland. A number of common forbs such as yarrow, milkvetch, and lupine were present. Rabbitbrush was the most common shrub.

CLIMATIC SECTION 5 - CAMAS PRAIRIE

This climatic type occupies the area between Grangeville, Lewiston, Orofino and Kamiah in Lewis, Idaho and Nez Perce Counties. A minor amount of the Nez Perce Forest is found in the unit south of Grangeville and most of the Nez Perce Indian Reservation are included. The area is very similar to Climatic Section 3 and is dominated by the Palouse grassland. Ponderosa pine and possibly some of the other types found along riparian zones represent the forest cover types. Precipitation ranges from 20 to 30 inches per year and landforms are palouse steppe or rolling uplands over basalt with a minor amount of dissected basalt uplands.

While settlement in the Grangeville area began about 1861 the majority of the area is in the Nez Perce Indian Reservation which was not opened to settlement until 1895. This led to rapid development and by 1900 there was an increase of about 10,000 people over the 1890 census. Between 1898 and 1905 numerous small mills were started to supply local needs. In 1910 a large mill was built in Winchester and lumber was sawn for export.

Forested Types (37 percent)

Ponderosa pine - This type accounts for about 31 percent of the cover type for the unit. County figures describing stand structure may be misleading for this area because of the large amount of cutting on private lands between 1910 and 1930. Mature and old growth stands probably accounted for between 44 and 58 percent of the stands while stands less than 40 years accounted for between 8 and 34 percent. These stands would have been open grown essentially pure ponderosa pine.

Other forest types - The remaining forested portion of the area included a mixture of types and accounted for about 6 percent of the unit. Douglas-fir (4 percent) and larch-Douglas-fir (2 percent) cover types were the most common. Minor amounts of riparian types would have been found associated with major drainages.

Stand structure for these types would have been similar to Climatic Section 6.

Grassland Types (63 percent)

Wheatgrass-fescue - Two variations of the wheatgrass type were found in the area. The area around Lewiston and Craigmont had significant amounts of sandberg bluegrass associated with it. It occupied about half of the grassland type in the Climatic Section. Conditions are similar to those described in Climatic Section 4. The remaining area was dominated by wheatgrass-fescue and was slightly more mesic than the wheatgrass-bluegrass type. It is similar to the description in Climatic Section 3.

CLIMATIC SECTION 6 - CLEARWATER

This is an area between the Selway and Salmon Rivers in Idaho. Forests covered include most of the Nez Perce and the Magruder portion of the Bitterroot. It is entirely in Idaho county.

The area is under the influence of the maritime climate with precipitation ranging from 20 to 70 inches. Landforms are a mixture of breaklands and mountain slopes with granitic soils. A minor amount of the area was glaciated. Cover types had moderate to high

percentages of young stands when compared to similar types in the other Climatic Sections. Conversely the number of old growth stands was low to moderate in comparison with the other Climatic Sections. This structure would indicate a higher than normal impact from fire than other parts of Idaho or western Montana.

Timber harvest started about 1863 in conjunction with mining activity at Elk City. Activity was intermittent until 1878 when a number of small mills were developed to provide lumber for local use. By 1924 there were 21 small plants in Idaho County, however, the production of sawlogs was greatly exceeded by fuelwood through this period. By the 1930's less than 1 percent of the Federal ownership had been logged.

Major Cover Types

Forested Types (96 percent)

Western white pine - The data suggests that about 2 percent of the area was covered with this type but it may be significantly less. The type shows a high level of disturbance with about 50 percent below 40 years of age and less than 10 percent in an old growth condition. Young stands were moderate to well stocked with only 15 percent shown as poor. This type reaches its southern limit along the north boundary of the unit.

Ponderosa pine - About 45 percent was old growth which is at the low end for the cover type and 18 percent was less than 40 years of age. Young stands were similar in stocking at all levels with 78 percent well and moderate and 22 percent listed as poorly stocked. The type represents about 13 percent of the land area.

Larch-Douglas-fir - The stands tended to be younger aged with 35 percent less than 40 years and 21 percent old growth which is lower than expected. Young stands tended to be well or moderately stocked however 27 percent were considered poorly stocked. This was a minor type representing about 5 percent of the land area.

Douglas-fir - Stands were dominated by younger aged conditions with 60 percent less than 40 years and only 7 percent old growth. About 50 percent of the stands were nonstocked indicating the slower recovery on these drier and warmer slopes as compared to the lodgepole cover type. This structure suggests a high level of disturbance as indicated in the other cover types. All levels of stocking were common with poor stocking having a slight edge (41 percent). The type was found on about 16 percent of the land area.

Lodgepole pine - This type contained the youngest stands with about 70 percent less than 40 years of age and 93 percent less than 100 years. About 27 percent was unstocked which along with the adjacent nonstocked Douglas-fir type would have left many of the upper slopes and ridgelines bare of tree growth. About 2 percent was old growth. Young stands were predominately well stocked (86 percent) with some moderately stocked (10 percent). The type was one of the most common types with about 20 percent of the land area occupied. A group of types are lumped as spruce-fir on the vegetation maps and would have included the following types. In addition minor amounts of these types would have been found in the riparian areas or moist benches included in the other types which were too small to map separately. In total they accounted for about 13 percent of the land area.

Engelmann spruce - About 46 percent was under 40 years of age and 22 percent was old growth which is opposite what would normally be found in this type. Young stands were predominately poorly stocked (82 percent) with 16 percent moderately stocked. This structure seems to support a frequent fire sequence. Over 4 percent of the land area was occupied by this type.

Western hemlock-Grand fir - It was dominated by mature stands with 50 percent meeting old growth definition and only 6 percent less than 40 years of age. Young stands tended

to be moderately to poorly stocked with only 18 percent considered well stocked. It accounted for about 4 percent of the land area.

Western redcedar - This is a minor type found along the larger drainages. About 21 percent were under 40 years of age and 59 percent considered old growth. Young stands were generally well stocked or moderately stocked with only 3 percent considered poorly stocked. This was a very limited type with only a trace present.

Western redcedar-Grand fir - Old Growth stands were limited with only 4 percent meeting the definition. About 42 percent were less than 40 years of age again indicating the influence of past fire activity. Young stands tended to be well stocked (47 percent) or moderately stocked (33 percent). It occupied about 4 percent of the land area.

Alpine - This type covered a major portion of Climatic Section 6 accounting for 20 percent of the area. The type was dominated by lodgepole pine, whitebark pine or mixtures of subalpine fir and spruce. Age data was not available for this type however about 4 percent was shown as burned and nonstocked. Stands tended to be open and somewhat variable in coverage.

Noncommercial Forest - This area represented sites that were steep and rocky and normally found at upper elevations. Data is not available on structure or composition of these sites. Around 3 percent of the land area was in this type.

Other - An additional 6 percent was listed as old burns however the cover type was not indicated. These areas were probably associated with sites that were marginal for tree growth as a result of limited soil or moisture holding capability.

Nonforested Types (4 percent)

Grassland - Scattered through the area are a number of high energy slopes or soils with high water tables that were dominated by grass types. These were highly variable depending on local site conditions and ranged from the xeric bunchgrass types such as wheatgrass-fescue to wet sedge meadows. Just under 3 percent of the area was in this type.

Other - The remaining area which was less than one percent was occupied by barrens, shrub communities or areas under cultivation.

TABLE 4 - PERCENT ACRES BY AGE CLASS BY COVER TYPE FOR CLIMATIC SECTION 6
Forest Service Acres Only

COVER TYPE	NON STOCKED	SEEDINGS & SAPLINGS 1-40 YRS	POLES 41-60 YRS	IMMATURE 61-100 YRS	MATURE 101-VAR.YRS	POTENTIAL OLD GROWTH 121+*YRS
W.White Pine	40.8	9.1	2.3	16.7	21.6	9.5
Ponderosa P	14.6	3.9	0.7	5.9	29.5	45.4
Larch-						
Douglas-Fir	15.7	19.7	3.2	12.6	28.0	20.8
Hemlock-						
White Fir	3.4	3.0	2.4	6.7	34.9	49.6
Douglas-Fir	49.7	10.5	4.9	8.6	18.9	7.4
Engelmann						
Spruce	43.2	2.6	2.1	8.5	21.3	22.3
Lodgepole P	27.0	42.6	10.3	13.1	4.7	2.3
W.Red Cedar	8.6	12.5	3.6	3.4	12.9	59.0
Cedar-						
White Fir	25.6	16.8	7.1	14.8	31.7	4.0

Avg for
Climatic S. 27.3 13.8 4.2 10.0 23.5 21.2

CLIMATIC SECTION 7 - SEVEN DEVILS

This is a very small area in Hell's Canyon Wilderness area which is associated with a much larger area south of the Salmon River. It is located in Idaho County on the Nez Perce Forest.

Climatic conditions are generally warm with precipitation varying from 10 to 40 inches. Landforms consist of breaklands and ice scoured highlands on the Belt substrate.

Data is not presently available for the unit as most of it lies outside of Region One. Information from the adjacent area suggests that the warm dry lowlands were covered by the wheatgrass-fescue or the ponderosa pine cover types. They accounted for 29 and 40 percent of the land area respectively. Lodgepole pine (24 percent) and Douglas-fir (8 percent) were common on the uplands. Age structure was probably similar to Climatic Section 6.

CLIMATIC SECTION 8 - ST.JOE-LOCHSA

This is a large area occupying the central portion of North Idaho and a minor amount of Montana. Forests covered include all of the Coeur d' Alene, St. Joe, Clearwater and portions of the Nez Perce (Moose Creek Drainage), Lolo (west end), Kootenai (extreme south part) and Kaniksu (south of Pend Orille Lake). It covers all or part of Benewah, Bonner, Clearwater, Kootenai, Idaho, Latah and Shoshone counties in Idaho and parts of Mineral and Sanders Counties in Montana.

The area is dominated by the maritime climatic influence with precipitation ranging from 40 to 80 inches. Landform is variable and includes various mountain slopes, breaklands and ice scoured areas. Granitics, belts and argillites and other parent materials are present. Temperatures are considered cool on most sites except high energy south and west slopes. Cover types generally have moderate to high percentage of old growth and also a moderate to high amount of stands less than 40 years of age. This structure would suggest a higher than normal amount of stand replacement fire with a longer period free of damaging fires than found on the other Climatic Sections in Idaho.

Logging activity began at Pierce about 1861 and at Elk City and Florence about 1863 to provide lumber for the mining activity. Small mills began to appear in Idaho about 1878 to provide lumber for local use and by the 1890's mills were scattered throughout the area. It was not until 1900 however, that large mills were constructed that began to cut a significant amount of the mature stands. In Montana some logging occurred in the 1860's to support the mining activity near Superior. With the arrival of the railroad in the 1880's timber immediately adjacent to the right-of-way was heavily cut for construction and export to outside markets. By the 1930's about 9 percent of the Federal ownership had been logged in Idaho and about 12 percent in Montana.

Major Cover Types

Forested types (89 percent)

Western white pine - Stand structure tended to be somewhat evenly distributed among the age classes with about 41 percent less than 40 years of age and 27 percent old growth. About 51 percent of the young stands were well stocked and only 15 percent listed as

poorly stocked. The type dominated the Climatic Section with over 31 percent of the land occupied by it.

Ponderosa pine - Stands were dominated by mature stands with 49 percent old growth. About 21 percent were less than 40 years of age. Young stands were similar in stocking at all levels with 78 percent well and moderate and 22 percent listed as poorly stocked for Idaho. About 13 percent of the area was in the ponderosa pine type.

Larch-Douglas-fir - The stands tended to be younger aged with 49 percent less than 40 years. About 20 percent were old growth which is somewhat lower than expected. Young stands tended to be well stocked however 24 percent were considered poorly stocked. Almost 11 percent of the area was in this type.

Douglas-fir - Stands tended to be younger aged with 55 percent less than 40 years and 7 percent old growth. These stands were similar to the lodgepole pine cover type showing a high level of disturbance. All levels of stocking were common in young stands with poor stocking having a slight edge. This type accounted for over 4 percent of the area.

Lodgepole pine - This type contained the youngest stands with about 77 percent less than 40 years of age and 93 percent less than 100 years. In addition about 34 percent was unstocked which would have left many of the upper ridgelines bare of tree growth. About 3 percent met the old growth definition. Young stands were largely well stocked (73 percent) with some moderately stocked (18 percent). About 7 percent of the area was occupied by this type. Engelmann spruce - About 19 percent were under 40 years of age and 42 percent was old growth which is similar to the ponderosa pine type age structure. Contrary to what may be thought, the young stands tended to be moderate to poor in stocking which could be a reflection of frequent underburning from fire originating in the adjacent uplands. Engelmann spruce was a minor type representing only a little over 1 percent.

Western hemlock-Grand fir - The type is characterized by mid age to overmature stands with about 45 percent old growth and 13 percent less than 40 years of age. This type had the same coverage as Engelmann spruce.

Western redcedar - Old growth stands are common in the western redcedar type (74 percent) with stands less than 40 years found on about 9 percent of the type. The type occurred in only trace amounts.

Western redcedar-grand fir - The western red cedar-grand fir type shows more disturbance with only 17 percent in old growth and 36 percent less than 40 years of age. Young stands are evenly divided among the three stocking classes. Less than 2 percent of the area was occupied by this type.

Cottonwood - A trace amount of cottonwood cover type was located along the major drainages through out the area. These commonly were confined to a narrow strip adjacent to the stream or on periodically flooded terraces. About 53 percent was classified as saw timber sized material and 47 percent pole sized. No seedling or sapling areas were indicated.

Alpine and noncommercial - About 12 percent of the Climatic Section was in this cover type. It generally represented the high subalpine type however rocky areas at all elevations were included. Cover types were various mixtures of lodgepole pine, whitebark pine, Engelmann spruce, and subalpine fir. Data is not available to describe stand or age structure. About 5 percent was described as nonstocked as the result of fire. Stands tended to be open and somewhat variable in coverage.

Other - An additional 7 percent was listed as old burns however the cover type was not indicated. These areas were probably associated with sites that were marginal for tree growth as a result of limited soil or moisture holding capability.

Nonforested Types (11 percent)

Grassland - While some natural grasslands existed they accounted for only about 4 percent of the land area. These were made up of types similar to the wheatgrass-fescue type described in Climatic Section 3 and edaphic types which occurred as small inclusions in the general forest area. Vegetation composition was highly variable on the edaphic types ranging from the wheatgrass-fescue type to wet sedge meadows.

Other - A minor amount of the unit was typed as brush or barren (less than 1 percent) with the remaining area in cultivation or pasture which represented about 7 percent of the land area. It is most likely that much of this acreage was originally in the moist riparian types or grasslands and was found in the major valleys at low elevation.

TABLE 5 - PERCENT ACRES BY AGE CLASS BY COVER TYPE FOR CLIMATIC SECTION 8
Forest Service Acres Only

COVER TYPE	NON STOCKED	SEEDINGS & SAPPLINGS 1-40 YRS	POLES 41-60 YRS	IMMATURE 61-100 YRS	MATURE 101-VAR.YRS	POTENTIAL OLD GROWTH 121+*YRS
W.White Pine	18.4	22.2	4.5	14.5	13.7	26.7
Ponderosa P	12.6	8.5	4.2	5.8	19.5	49.4
Larch-						
Douglas-Fir	27.0	22.1	5.5	10.9	14.7	19.8
Hemlock-						
White Fir	2.9	9.7	2.4	7.5	32.5	45.0
Douglas-Fir	35.5	19.3	6.3	14.7	17.2	7.0
Engelmann spruce	13.7	5.7	2.5	12.3	23.6	42.2
Lodgepole P	33.6	43.1	6.8	9.2	4.0	3.3
W.Red Cedar	3.6	5.0	1.1	9.2	7.4	73.7
Cedar-						
White Fir	20.4	15.4	6.2	12.8	28.5	16.7
Avg for Climatic S.	21.8	21.8	5.0	12.0	14.9	24.5

CLIMATIC SECTION 9 PEND OREILLE

This area occupies the extreme northern portion of Idaho and the Purcell and Cabinet Mountains of Montana. Forests covered include most of the Kaniksu and the western portion of the Kootenai. It covers all of Boundary and part of Bonner counties in Idaho and part of Lincoln and Sanders counties in Montana.

The area is the center of the Inland Empire Region and central to the maritime climatic influence in Idaho. Precipitation ranges from 40 to 80 inches with adequate moisture for tree growth on all but the driest slopes. Winters are relatively mild with abundant snowfall. The entire unit has been impacted by continental glaciation. Mountain slopes and valley bottoms have glacial deposition with some of the high ridges and peaks impacted by ice scouring. Most of the area is in the Belt supergroup.

Logging began in this area after the arrival of the Great Northern Railway in 1892 and the large mills began activity about 1900. By the 1930's about 12 percent of the Federal ownership had been logged in Idaho with probably a similar amount in Montana.

Major Cover Types

Forested Types (93 percent)

Western white pine - Stand structure tended to be somewhat evenly distributed among the age classes with about 44 percent less than 40 years in age and 34 percent old growth. Young stands tended to be well stocked with 64 percent classified as such in the portion not cut. While not as common as found in Section 8, the white pine type accounted for almost 18 percent.

Ponderosa pine - Stands were dominated by mature age conditions with 57 percent considered old growth. Only about 19 percent were less than 40 years of age. About half of the young stands were considered poorly stocked and 36 percent moderately stocked in the Idaho portion. It was a fairly common type on about 15 percent of the unit.

Larch-Douglas-fir - The stands tended to be younger aged stands with 51 percent less than 40 years. About 25 percent were old growth which is lower than expected. Young stands tended to be well stocked however 31 percent were considered poorly stocked. This type appears to have been more variable than most of the types. It was the most common type in the Climatic Section representing 25 percent of the area.

Douglas-fir - Stands tended to be younger aged with 54 percent less than 40 years of age and 16 percent meeting old growth definition. All levels of stocking were common. Only 1 percent was in this type.

Lodgepole pine - About 76 percent of the stands were less than 40 years of age and 93 percent less than 100 years. In addition about 28 percent was unstocked. About 2 percent was old growth. Young stands were dominated by well stocked conditions (90 percent) and the cover type was found on about 8 percent of the area.

Engelmann Spruce - About 15 percent were under 40 years of age and 48 percent met the old growth definition which is similar to the ponderosa pine type age structure. Young stands tended to be moderate to poor in stocking which could be a reflection of frequent underburning from fire originating in the adjacent uplands. The type was confined to less than 4 percent of the area.

Riparian - The last group is composed of three minor cover types found in the lower elevation riparian zones and moist north slopes which in total did not make up one percent of the land area. Western hemlock-grand fir was a minor component on the warmer riparian sites or moist flats. Western red cedar cover type made up the bulk of the riparian zone. Western red cedar-grand fir was commonly found on north slopes and not necessarily in the riparian zone. The western red cedar type was typically dominated by old growth stands (86 percent) with stands less than 40 years found on only 4 percent of the type. The other two types were more uniform in age structure with between 50 and 55 percent meeting old growth definition and 14 to 19 percent less than 40 years of age. Young stands were typically well stocked (60 percent) however 26 percent were also found in a poor stocking condition. A minor amount of cottonwood cover type was associated with the major stream bottoms. They accounted for just over 1 percent of the area.

Alpine and noncommercial - This type found on 18 percent of the area was dominated by lodgepole pine, whitebark pine or mixtures of subalpine fir and spruce or rocky and steep slopes with limited tree cover. Age data was not available for this type however about 2 percent was shown as burned. Stands tended to be open and somewhat variable in coverage.

Other - An additional 4 percent was listed as old burns however the cover type was not indicated. These areas were probably associated with sites that were marginal for tree growth as a result of limited soil or moisture holding capability.

Nonforest - The remaining area represented about 7 percent of the area and included grass, brush, barren (rock) and cultivated or stump pasture areas. No information was available on species composition of these sites.

TABLE 6 - PERCENT ACRES BY AGE CLASS BY COVER TYPE FOR CLIMATIC SECTION 9
Forest Service Acres Only

COVER TYPE	NON STOCKED	SEEDINGS & SAPPLINGS 1-40 YRS	POLES 41-60 YRS	IMMATURE 61-100 YRS	MATURE 101-VAR. YRS	POTENTIAL OLD GROWTH 121+*YRS
W.White Pine	19.8	24.7	3.3	5.2	12.6	34.3
Ponderosa P	7.8	11.3	6.2	5.4	12.7	56.5
Larch- Douglas-Fir	22.3	28.1	7.5	6.0	11.3	24.6
Hemlock- White Fir	2.3	17.0	0.0	0.0	25.4	55.1
Douglas-Fir	12.9	41.0	4.0	9.9	16.3	15.9
Engelmann spruce	2.4	12.4	1.8	5.7	29.7	47.9
Lodgepole P	28.4	47.6	12.5	4.8	4.4	2.3
W.Red Cedar	2.0	1.7	1.0	4.1	5.3	85.9
Cedar- White Fir	5.7	8.0	17.2	3.1	15.6	50.2
Avg for Climatic S.	19.3	27.4	6.7	5.6	12.0	29.0

CLIMATIC SECTION 10 - LOWER FLATHEAD

This area includes most of the Flathead Indian Reservation, and includes Flathead Lake north westerly to Columbia Falls and Eureka and from Plains to Libby to the Canadian boundary. It covers portions of Lincoln, Flathead, Sanders, Mineral and Lake Counties. Portions of the Kootenai, Flathead and Lolo Forests are included.

While the area is dominated by the maritime climatic influence it is subject to intrusions of cold arctic air in the winter. As a result Climatic Section 10 is cooler than area 9 and species such as western hemlock are found only on cove or sheltered areas. Precipitation ranges from a low of about 18 inches in the valley bottom to a high of over 100 inches on the Continental Divide. Moisture is adequate for tree growth on all but the driest sites in the major valley bottoms. While winters are still relatively mild, occasional blasts of cold arctic air can cause frost damage on the more sensitive species associated with the maritime belt. Glacial deposition dominates both valley bottoms and mountain slopes over most of the area. Some of the steeper slopes along the Continental Divide are on belt rocks which show ice scouring.

Major vegetative impacts probably began with the arrival of the Great Northern Railroad in the 1890's. This event plus the demand for wood products in the Great Falls area to support the smelting industry caused rapid change. By the time the timber inventory was conducted in the mid 1930's about 16 percent of the Climatic Section was harvested. The majority of this cutting occurred on private lands in the major valley bottoms where 19 percent of the ponderosa pine type was harvested. About 14 percent of the white pine stands had been entered and 13 percent of the other forest types. Approximately 7 percent of the Forest Service ownership was harvested

Major Cover Types

Forested Types (84 percent)

Western white pine - Stand structure was more or less equally divided among the age classes with about 48 percent less than 40 years in age and 22 percent meeting the old growth definition. This distribution is typical for western Montana. The type reaches its eastern boundary in the area and only covers about 5 percent of the land area.

Ponderosa pine - Stands tended to be mature with about 53 percent in the old growth category and 19 percent less than 40 years of age which is typical for western Montana. Approximately 19 percent of the Climatic Section contained ponderosa pine cover type.

Larch-Douglas-fir - The stands tended to be evenly distributed over the various age classes with 39 percent less than 40 years. About 30 percent met the old growth definition. Stand conditions were typical of western Montana and the type was found on 27 percent of the area. This type was the most common cover type found in Climatic Section 10.

Douglas-fir - This type was commonly found on cooler and drier sites often at mid slope. Stands were dominated by mid aged conditions with 22 percent less than 40 years and 16 percent old growth. These conditions indicated a more mature cover type than normally found over the remainder of western Montana. The type covered about 1 percent of the area.

Lodgepole Pine - About 91 percent was less than 100 years of age and 70 percent less than 40 years of which about 27 percent was unstocked. A little less than 3 percent was old growth. While the percent of old growth was similar to the average for western Montana there was significantly more area in stands less than 40 years of age. The area nonstocked also was about 10 percent higher than the average. This was an important type covering about 9 percent of the area.

Engelmann Spruce - About 8 percent was under 40 years of age and 48 percent met the old growth definition which is the average for the Climatic Section. While the inventory suggested the type only represented 3 percent of the area, major areas are shown on the Regional vegetation map. Because of the mixed composition of stands in this Climatic Section some of these mapped sites were likely inventoried as larch-Douglas-fir types.

Riparian Area Cover Types

Western hemlock-Grand fir - It was dominated by mature stands with 51 percent meeting old growth and 12 percent less than 40 years of age. Western hemlock is found only on protected sites within the area and represented only a trace in coverage.

Western red cedar - This is a minor type found along the larger drainages. About 19 percent were under 40 years of age and 65 percent considered old growth. This type also was found only in trace amounts.

Western red cedar-grand fir - Age structure was more or less evenly distributed with old growth stands occupying about 33 percent of the area and about 24 percent less than 40 years of age.

These three cover types plus the cottonwood type are not mapped on the Regional vegetation map because of their limited coverage. While minor amounts of cedar may be mixed in with other cover types only narrow stringers along the drainages supported enough cedar to type as a cover type. The cottonwood type found along the major valleys were the most common riparian type. About half of the area was classed as sawtimber with

the remaining shown as seedling, sapling or poles. The combined area of the four types was less than 1 percent.

Alpine and noncommercial - These types covered about 17 percent of the area. The area was dominated by lodgepole pine, whitebark pine or mixtures of subalpine fir and spruce. Age data was not available for this type however about 17 percent of the Forest Service area was shown as burned. It is most likely that much of this burn was a result of the 1910 fire season however portions may represent the 1889 season.

Other - An additional 3 percent was listed as old burns however the cover type was not indicated. These areas were probably associated with sites that were marginal for tree growth as a result of limited soil or moisture holding capability.

Nonforested Types (16 percent)

The remaining area was composed of a mixture of various vegetation types and represents about 16 percent of the area. Areas typed as rock or barren, brush or grass or cultivated areas made up this type. About 5 percent of it may have been in a grass type. The grass community was composed principally of the wheatgrass-fescue type and was found primarily southwest of Flathead Lake plus other dry exposures. Vegetative composition on the drier sites was dominated by bluebunch wheatgrass, rough fescue and neddleandthread. On moister sites rough fescue was the dominant species along with Idaho fescue and bluebunch wheatgrass. Big sagebrush was the major shrub on both conditions. These two types were equally represented in the area.

TABLE 7 - PERCENT ACRES BY AGE CLASS BY COVER TYPE FOR CLIMATIC SECTION 10
Forest Service Acres Only

COVER TYPE	NON STOCKED	SEEDINGS & SAPLINGS 1-40 YRS	POLES 41-60 YRS	IMMATURE 61-100 YRS	MATURE 101-VAR.YRS	POTENTIAL OLD GROWTH 141+*YRS
W.White Pine	24.8	23.5	3.4	6.0	19.9	22.4
Ponderosa P	9.4	9.6	8.3	7.2	12.2	53.3
Larch- Douglas-Fir	16.7	22.4	6.9	7.2	17.2	29.6
Hemlock- White Fir	1.6	10.7	9.8	0.0	26.8	51.1
Douglas-Fir Engelmann spruce	7.2	14.6	4.6	13.8	43.5	16.3
Lodgepole P	3.0	4.5	1.2	3.6	39.7	48.0
W.Red Cedar	27.6	42.2	13.7	7.3	6.6	2.9
Cedar- White Fir	11.0	8.1	0.8	9.1	6.2	64.8
Avg for Climatic S.	10.4	13.8	30.2	2.3	10.4	32.9
	17.8	24.4	8.1	7.0	16.5	26.2

CLIMATIC SECTION 11 BITTERROOT-BLACKFOOT

This area represents a transition zone between the Pacific Maritime zone of northwest Montana and northern Idaho and the Continental climatic zone east of the Continental Divide. It includes all of Ravalli and portions of Missoula, Mineral, Sanders, Lake, Flathead, Granite, Powell and Lewis and Clark Counties. The area in Lake and Sanders Counties is all part of the Flathead Indian Reservation. Portions of the Bitterroot, Lolo, Flathead and Helena Forests are included.

Precipitation ranged from over 80 inches on the Bitterroot Divide to less than 14 inches in the valleys. Climatic conditions are cooler and drier than Section 10 and other than western hemlock all species associated with the Pacific Coast forest reach their southeastern limits within the unit. Over much of the area these species are restricted to moist environments such as the canyon bottoms along the Bitterroot Mountains. Significant acreages of grass types are found on the drier sites at low elevations east of the Bitterroot River. The preponderance of the soils are associated with the Belts or areas impacted by alpine glaciation. Major valleys contain glacial deposits and high ridgelines have been subjected to glacial scouring. While glacial activity is present it did not impact the landscape to the same degree as in Section 10 and as a result slopes tend to be steeper with narrow valley bottoms.

Some of the earliest settlement in the state occurred in this Climatic Section in the 1840's, however, it wasn't until the arrival of the railroad and development of the mining operation in Butte and Anaconda in the 1880's that there was any significant impact on the forest structure. By the 1890's major portions of the Clark Fork and Bitterroot Valleys had been logged and by the 1930's almost 22 percent of the area was logged. This included 40 percent of the ponderosa pine cover type, 17 percent of the white pine type and 14 percent of other types. About 14 percent of the Forest Service holding were effected. Other than the area immediately adjacent to Butte this unit experienced some of the earliest impact from man's activities particularly in the ponderosa pine cover type.

Major Cover Types

Forested Types (82 percent)

Western white pine - Only trace amounts of this cover type are found in the unit as it reaches its climatic limits. Stand structure tends to be concentrated in the mature class with about 21 percent less than 40 years in age and 22 percent old growth which is typical for the type.

Ponderosa pine - Stands tended to be mature with about 60 percent in an old growth condition and 16 percent less than 40 years of age. The amount of old growth is somewhat higher than the average for western Montana and probably reflects the drier environment where light underburning would be more prevalent. This was one of the major components of this Climatic Section representing about 17 percent of the land area.

Larch-Douglas-fir - While still an important component representing about 10 percent of the area this type reaches its southeastern limits within the Climatic Section. The stands tended to be evenly distributed over the various age classes with 30 percent less than 40 years and 35 percent old growth. This represents a slightly older structure than the average for western Montana again representing the drier conditions and more opportunity for light underburns.

Douglas-fir - Because much of the Climatic Section is outside the natural range of larch the pure Douglas-fir cover type becomes more important representing about 9 percent of the area. Stands were generally dominated by mid aged conditions with 22 percent less than 40 years and 7 percent old growth. While the old growth component is typical for western Montana the younger aged stands are significantly less. This may represent a lesser impact from the 1889 and 1910 fire years in this area.

Lodgepole Pine - The lodgepole pine cover type occupies slightly less area than ponderosa pine (13 percent) increasing in amount toward the south end of the Climatic Section. On 61 percent of the area lodgepole was less than 40 years of age and 92 percent less than 100 years which is less than the average for western Montana; however, less than 1 percent was old growth which is half of the average for western Montana. Leiberg's

work suggests that about 80 percent was less than 40 years of age in 1880's which would generally agree with the above considering the different time periods. Older stands seemed to be more prevalent at the southern end of the Climatic Section.

Engelmann Spruce - This type becomes less important compared to Climatic Section 10 and 12 occupying about 1 percent of the area. About 6 percent were under 40 years of age and 51 percent were old growth which is about the average for western Montana. Much of the type was found in high elevation basins and was typed as alpine type during the timber inventory therefore the Regional vegetation map shows more area for the type. Under these conditions stands may have been older and the structure for the group may be biased by the lower elevation stands.

Riparian Area Cover Types

Western hemlock-Grand fir, Western red cedar, Western red cedar-grand fir - Because of the limited acreage that these three types represent in the area they have been treated as one. Stands typically are found in riparian areas or moist benches primarily west of the Clark Fork and Bitterroot Rivers. Stands tend to be mature with 50 percent meeting the old growth definition. Only 17 percent were less than 40 years of age. These types are found only in trace amounts. Adjacent to the Bitterroot and Clark Fork Rivers is found a narrow band of cottonwood type which is also limited in area. About 80 percent of these stands were seedling, sapling or pole sized with the remaining 20 percent considered sawtimber sized. The sum of these four types is less than 1 percent of the land area.

Alpine and noncommercial forest - This type covered about 30 percent of the area and was particularly important along the Bitterroot Mountains. The area was dominated by lodgepole pine, whitebark pine, alpine larch or mixtures of subalpine fir and spruce. Age data was not available for this type however present stand structure suggests that well stocked mature to old growth spruce basins were present. These were surrounded by stands of lodgepole or other species of various ages.

Other - An additional 2 percent was listed as old burns however the cover type was not indicated. These areas were probably associated with sites that were marginal for tree growth as a result of limited soil or moisture holding capability.

Nonforested Types (18 percent)

Other - The remaining area was composed of a mixture of brush, grass, barren or cultivated types and represented about 18 percent of the area. About 15 percent of these types would have been in the wheatgrass-fescue cover type. The drier types east of the Bitterroot River to near Sleeping Child Creek were dominated by bluebunch wheatgrass and rough fescue along with varying amounts of needleandthread, junegrass, needlegrass and basin wildrye. In the upper valley and west of the river where moisture was more abundant rough fescue was the dominant species along with Idaho fescue and bluebunch wheatgrass. Big sagebrush was probably a scattered shrub on both sites along with a variety of forbs such as yarrow and native legumes.

TABLE 8 - PERCENT ACRES BY AGE CLASS BY COVER TYPE FOR CLIMATIC SECTION 11
Forest Service Acres Only

	NON	SEEDINGS &	POLES	IMMATURE	MATURE	POTENTIAL
	STOCKED	SAPLINGS				OLD GROWTH
COVER TYPE		1-40 YRS	41-60 YRS	61-100 YRS	101-VAR.YRS	141+*YRS
W.White Pine	10.0	2.3	2.5	14.0	45.9	25.3

Ponderosa P	7.8	9.4	4.3	3.4	18.7	56.4
Larch-Douglas-Fir	14.4	16.6	7.1	9.2	20.2	32.5
Hemlock-White Fir	0.0	0.0	93.3	0.0	1.1	5.6
Douglas-Fir	3.6	19.7	7.9	29.2	32.2	7.4
Engelmann spruce	0.4	2.2	2.1	13.4	50.0	31.9
Lodgepole P	10.7	37.0	10.9	30.6	7.9	2.9
W.Red Cedar	20.5	45.2	0.0	22.3	0.6	11.4
Cedar-White Fir	5.5	7.9	13.4	28.6	14.7	29.9
Avg for Climatic S.	9.1	22.7	8.0	19.9	18.4	21.9

COVER TYPE	NON STOCKED	SEEDINGS & SAPLINGS 1-40 YRS	POLES 41-60 YRS	IMMATURE 61-100 YRS	MATURE 101-VAR.YRS	POTENTIAL OLD GROWTH 141+*YRS
W.White Pine	10.0	2.3	2.5	14.0	45.9	25.3
Ponderosa P	7.8	9.4	4.3	3.4	18.7	56.4
Larch-Douglas-Fir	14.4	16.6	7.1	9.2	20.2	32.5
Hemlock-White Fir	0.0	0.0	93.3	0.0	1.1	5.6
Douglas-Fir	3.6	19.7	7.9	29.2	32.2	7.4
Engelmann spruce	0.4	2.2	2.1	13.4	50.0	31.9
Lodgepole P	10.7	37.0	10.9	30.6	7.9	2.9
W.Red Cedar	20.5	45.2	0.0	22.3	0.6	11.4
Cedar-White Fir	5.5	7.9	13.4	28.6	14.7	29.9
Avg for Climatic S.	9.1	22.7	8.0	19.9	18.4	21.9

CLIMATIC SECTION 12 UPPER FLATHEAD

Included is the area east of Flathead Lake to the Continental Divide from the Canadian boundary south to the Swan River-Clearwater River Divide. It includes portions of Flathead, Lake, Missoula and a minor portion of Powell Counties. Portions of the Flathead and Lolo National Forests and the western part of Glacier Park are included.

Climatic conditions are similar to Climatic Section 9 however while white pine stands dominate Section 9, western larch is the major cover type in Section 12. Occasional movements of arctic air can also invade the area during the winter months resulting in death or frost damage to the sensitive species associated with the maritime climate. As a result these species are confined to protected areas or sites influenced by Flathead Lake. Precipitation ranges from 16 inches along Flathead Lake to more than 100 inches on the Continental Divide. The Swan Valley averages about 30 inches. The entire area has been impacted by continental or alpine glaciation with the valleys composed of glacial deposition. Most areas are underlain with belt or carbonate rock shaped by glacial activity. Slopes are moderate to steep with some mountains of glacial material being low to moderate in steepness.

The arrival of the Great Northern Railway in 1892 had the most impact on the forested areas particularly adjacent to the right-of-way. By the 1930's almost 19 percent of

the Climatic Section had been logged. About 31 percent of the ponderosa pine cover type had been entered and 16 percent of the other types which would have largely represented the larch communities. Nine percent of the white pine had also been entered. Of the Forest Service ownership over 5 percent had been harvested during the same time period.

Major Cover Types

Forested Types (96 percent)

Western white pine - Stands tended to be concentrated in the mature class with about 21 percent less than 40 years in age and 22 percent old growth which is typical for western Montana. The type reaches its most eastern extension and is not well represented making up only about 2 percent of the coverage.

Ponderosa pine - Found on 2 percent of the Climatic Section the type is not as important as on the drier portions of Sections 10 and 11. Because of the moister conditions larch is commonly found in the large valley bottoms occupied by ponderosa pine elsewhere. Stands tended to be mature with about 60 percent in old growth and 16 percent were less than 40 years of age which represents slightly older conditions than average.

Larch-Douglas-fir - This type is the major cover type in Climatic Section 12 covering about 24 percent of the area. Stands tended to be evenly distributed over the various age classes with 30 percent less than 40 years. About 35 percent met the old growth definition. These percentages are slightly older than average for western Montana and may be the result of more open grown stand conditions in the valley floors which permitted more underburning conditions.

Douglas-fir - Stands were dominated by mid aged conditions with 22 percent less than 40 years and 7 percent old growth. The type is only a minor component representing about 2 percent of the area.

Lodgepole pine - The second most important cover type was the lodgepole pine type occupying about 20 percent of the area. About 61 percent was less than 40 years of age and 92 percent less than 100 years. Less than 1 percent was in old growth. These age conditions were younger than the average for western Montana and probably represent the influence of the better growing conditions which permitted more biomass accumulation and subsequently more severe and frequent fires. Early observations by investigators such as Ayres suggest that the coverage of the larch and lodgepole types may have fluctuated significantly over time based in large part on the severity of the last fire and the cone crop of western larch.

Engelmann Spruce - The Engelmann spruce type is found on a significant portion of the area in broad riparian areas or moist benches and represents about 8 percent of the land area. About 6 percent of the type was under 40 years of age and 51 percent old growth which represents slightly more old growth than the average for western Montana.

Riparian Cover Types - Only a trace of these cover types were found and they are typically not mapped because of their limited size. Western hemlock-Grand fir, Western red cedar, Western red cedar-grand fir are typically found in riparian areas or moist benches. Stands tend to be mature with 50 percent meeting the old growth definition. Only 17 percent were less than 40 years of age. In addition, minor amount of cottonwood cover type were found in the major valleys with 69 percent shown as sawtimber and 31 percent other age classes in the 1930's.

Alpine and Noncommercial Forest - These types cover the largest portion of Climatic Section 12 and were found on about 35 percent of the area. Age data is not available for this type nor information on species composition. Lodgepole pine, whitebark pine

and Engelmann spruce did represent major species within the zone along with lessor amounts of subalpine fir and alpine larch.

Other - An additional 4 percent was listed as old burns however the cover type was not indicated. These areas were probably associated with sites that were marginal for tree growth as a result of limited soil or moisture holding capability.

Nonforested Types (4 percent)

The remaining 4 percent of the land area was occupied by nonforest vegetation with the grass types representing less than one percent of the area. Much of this type would have been found in the major valleys and the high elevations along the Continental Divide. Grass communities in the valley bottoms would have been similar to those found in Section 10. Many of the high elevation sites are moist environments and are dominated by hairgrass or sedges. Other species that may be present are oatgrass, alpine timothy, bentgrass or rushes. The remaining area was composed of rock covering about 3 percent and shrubs particularly in avalanche chutes covering the remaining 1 percent of the area.

TABLE 9 - PERCENT ACRES BY AGE CLASS BY COVER TYPE FOR CLIMATIC SECTION 12
Forest Service Acres Only

COVER TYPE	NON STOCKED	SEEDINGS & SAPPLINGS 1-40 YRS	POLES 41-60 YRS	IMMATURE 61-100 YRS	MATURE 101-VAR.YRS	POTENTIAL OLD GROWTH 121+*YRS
W.White Pine	11.7	9.7	1.2	4.6	51.0	21.8
Ponderosa P	3.5	12.5	6.2	5.0	10.0	62.8
Larch-						
Douglas-Fir	11.4	18.8	5.6	9.8	17.8	36.6
Hemlock-						
White Fir	0.0	0.0	64.5	0.0	10.7	24.8
Douglas-Fir	2.1	19.8	10.0	21.5	38.7	7.9
Engelmann						
spruce	1.9	4.2	4.8	3.5	28.6	57.0
Lodgepole P	18.2	43.0	12.4	18.2	7.4	0.8
W.Red Cedar	7.4	11.9	0.5	6.2	5.6	68.4
Cedar-						
White Fir	12.0	9.2	31.3	0.5	10.9	36.1
Avg for						
Climatic S.	10.5	21.6	7.2	10.6	18.0	32.1

CLIMATIC SECTION 13 - BEAVERHEAD-JEFFERSON

The southwestern corner of Montana is identified as Climatic Section 13 and includes the area west of the Madison Range and south of the Continental Divide to the state line. It includes portions or all of the Madison, Gravelly, Pioneer, and Bitterroot Mountain ranges. Portions of the Deerlodge, Beaverhead and Gallatin Forests are included. Counties covered are the Beaverhead, Madison, Gallatin, Broadwater, Jefferson, Powell, Granite, Deerlodge and Silverbow.

This Climatic Section is under the continental climate influence with cold winters and relatively dry growing conditions. The area is beyond the climatic limits of the Pacific coast species resulting in a limited number of tree species. Limber pine however is added to the list. Forest types cover about 33 percent of the zone with grass types found in the major valleys and throughout the forest region. Precipitation ranges from

50 inches on the highest points to 10 inches in the valleys. On some exposures sufficient moisture is not available before timberline conditions are encountered and grassland extend from the valley floor to the top of the mountain.

While not the earliest area settled in Montana, major vegetation changes occurred by the 1870's as a result of cattle grazing and logging in support of mining activities. By 1880 the easily accessible timber to the Butte area was gone which required extensive construction of flumes, tram ways and railroads to provide the wood necessary for mining activity. For example the smelter in Anaconda alone required 700 cords a day in the 1890's. By the 1930's data for the northwestern portion of the Climatic Section indicated that about 37 percent of the forests had been cut and Deerlodge county was in excess of 90 percent harvested. About 22 percent of the Forest Service ownership had been logged during the same time period. This pattern probably was common on all lands within 50 miles of Butte and Anaconda. Only survey level inventory information is available for the area east of the Continental Divide. Here, however, harvesting would have been limited to local use except near mining centers such as Bannack or Virginia City.

Limited historic surveys have been found for this area to date. Results of extensive surveys conducted in the 1940's indicated that 67 percent of the area was in commercial forest of which all but 1 percent was conifer. The remaining 7 percent of the area was non commercial forest. Stand structure in the 1940's was 22 percent sawtimber, 64 percent poles, 6 percent seedling and sapling and 6 percent poorly stocked or nonstocked. Cover type information was not available for the entire area however the volume of the various species does provide a clue to stand structure.

SPECIES	PERCENT BDFT	PERCENT CUFT
PP	3.8	2.7
L	T	T
DF	45.3	31.8
AF	1.6	2.3
ES	16.5	8.1
LP	29.5	51.0
WBP	2.6	2.6
ASPEN-COTTONWOOD	0.7	1.5

Board foot volumes averaged about 8.6 mbf for sawtimber stands and 1.6 mbf for pole stands. Some general conclusions have been developed from studies of the present stand age structure.

Forested Types (42 percent)

Douglas-fir - This type was found on foot slopes to the valleys and steep south and west facing slopes. Many of these sites were open grown or a savanna with large, old Douglas-fir. Stands could contain 5 or more age classes. The type was also found on north and east slopes. Here stands tended to be younger and more dense. Age structure was more uniform. For the northwestern portion of the Climatic Section, 38 percent of the stands were less than 40 years of age and about 2 percent met old growth conditions. The type probably occupied about 11 percent of the area.

Engelmann spruce - This was a minor type covering about 1 percent of the area. It was found on the moister environments where subalpine fir was commonly found in mixture with it. Age structure for the northwestern portion indicated about 12 percent was less than 40 years of age and about 4 percent was potentially old growth.

Lodgepole pine - The cover type occupied the majority of the forested area covering about 26 percent of the Climatic Section. Old growth stands appeared to have been more common in the type with about 4 percent meeting the age criteria in the northwestern portion of the area. Stands that were 200 to 300 years of age in 1900 are still commonly found

scattered over the area. Stand densities ranged from open grown conditions common on high elevation ridges or gentle slopes to dog hair thickets. Old growth stands were normally associated with the more gentle terrain. Only about 40 percent of the type was less than 40 years of age based on data for the northwestern portion. This would represent one of the lowest percentages found in the type across the Region.

Alpine and non commercial forest - This type was estimated to cover 5 percent of the section however information is not available to describe stand conditions.

Nonforested Types (58 percent)

Grassland - The dominant vegetation over 58 percent of the area was grassland. Two major types are recognized.

Wheatgrass-fescue - In this Climatic Section the type was generally an open to fairly dense grassland found in the valley bottoms or dry slopes. Major species were bluebunch wheatgrass, rough fescue, and needleandthread. Other species would have included yarrow, bluestem wheatgrass, sedge, wild buckwheat, prairie junegrass and pentstemon. This type was more common on the mid to northern portion of the area. On areas of shallow soil rough fescue become less important and prairie junegrass and needleandthread increased.

Sagebrush-grass - The southern and western portion of the area was occupied by this type. The vegetative structure was a dense to open grassland with a variable shrub component. The density of the shrub portion was primarily dependent on the length of time since the last fire. Dominant species included bluebunch wheatgrass and big sagebrush. Other components included other species of sagebrush, balsamroot, Idaho fescue, gromwell, lupine, ricegrass, phlox, bluegrass, bitterbrush and squirreltail.

Other types - In addition to the two types shown on the map there are some minor inclusions of other grass types which are not mapped. On high elevation sites are found alpine meadows which are dominated by bentgrass, sedges, hairgrass, fescue, woodrush, mountain timothy, bluegrass and spike trisetum. These sites vary from dense to very open with extensive barren areas. Forbs are also an important component of this type. At the other elevational extreme are sites in the valley bottoms that are subirrigated. A variety of species are commonly found here including tall reedgrasses, tufted hairgrass, American mannagrass, tall sedges, wheatgrasses, basin wildrye, willows, shrubby cinquefoil and numerous forbs. The Bighole valley represents a major expression of this type. Saline areas along the Bighole River were dominated by basin wildrye, alkali sacaton and nuttall alkaligrass. Greasewood and silver buffaloberry were common shrubs.

TABLE 10 - PERCENT ACRES BY AGE CLASS BY COVER TYPE FOR CLIMATIC SECTION 13

Forest Service Acres** Only

COVER TYPE	NON STOCKED	SEEDINGS & SAPLINGS 1-40 YRS	POLES 41-60 YRS	IMMATURE 61-100 YRS	MATURE 101-VAR.YRS	POTENTIAL OLD GROWTH 141+*YRS
Ponderosa P Larch-	2.3	9.1	1.0	4.1	60.4	23.1
Douglas-Fir	14.7	16.2	27.9	9.6	27.1	4.5
Douglas-Fir Engelmann spruce	5.2	33.0	13.1	19.8	27.0	1.9
Lodgepole P	4.1	8.3	3.7	20.3	59.2	4.4
Avg for Climatic S.	5.3	35.5	7.5	33.4	17.2	1.1
	5.2	33.5	8.6	28.8	21.8	2.1

** This table represents only the northeast corner of the Climatic

Section west of the Continental Divide. Preliminary analysis of fire history studies conducted on the Beaverhead Forest suggest that the lodgepole pine cover type may have been significantly older than found anywhere in the Region.

CLIMATIC SECTION 14 - YELLOWSTONE

The northern portion of Yellowstone Park and the area north of it to the Crazy Mountains is included in Climatic Section 14. It covers portions of the Galatin, Helena, Lewis and Clark, and Custer Forests and Yellowstone Park in Montana. Portions of Madison, Gallatin, Park, Sweetgrass, Stillwater, Carbon, Wheatland, Golden Valley and Meagher Counties are included. The Crazy Mountains, Big Belt, and Absaroka Ranges are found in the area. The Beartooth Plateau which is located on the eastern portion of the Climatic Section contains one of the most extensive alpine areas in Montana. This Section extends into Wyoming however information is not yet available for this portion. Precipitation exceeds 80 inches a year in the high alpine areas. Most of the forested area however averages between 30 and 50 inches. Amounts drop dramatically to less than 14 inches in the grass types in the northeastern portion of the area. Parent material varies greatly over the area with volcanics, quartzites, argillites and sandstones most prevalent on the uplands. These sites have been impacted by glacial erosion and deposition resulting in areas of steep mountain slopes to rolling uplands. The foothills exhibit similar parent material with tertiary sediments resulting from fluvial deposition more common. Sites are primarily impacted by frost churning and slopes are moderate. The major valley bottoms represent deposition areas from fluvial and glacial activity plus areas of lake sediments.

Impacts on the forested vegetation were limited prior to 1900 and were concentrated in mining areas along the Gallatin and Yellowstone Rivers and the Cooke City area. Cutting in Boulder and West Boulder Creeks occurred in the early 1880's with about 10 percent of the forested area in Area 14 harvested by 1904. The grasslands on the other hand experienced major impacts before 1900 as a result of cattle grazing in the 1880's.

Major Cover Types

Forested Types (27 percent)

Data from the 1940's timber inventory is limited to survey level information and does not provide much information on stand age and structure. The information on species composition is for all of southern Montana and because certain types are restricted in their location the data cannot be broken down by section. Survey work conducted in the early 1900's does provide some information about stand composition. This information is based on coverage of each species rather than cover type which may include a number of species. Consequently the information is not directly comparable to other Climatic Sections. Information is for Montana only and does not include the portion of the Climatic Section in Wyoming.

Forested Area - About 23 percent of the area contained typical forest communities. At the lower elevations stands were mixtures or pure stands of limber pine, minor amounts of ponderosa pine or Douglas-fir. On north slopes stands could be well stocked. On the remaining slopes, stands were generally open grown or savannas with trees being short and limby. Above 6,000 feet lodgepole pine was the major cover type and found in pure stands which were well stocked or mixed with Douglas-fir and Engelmann spruce. Douglas-fir was abundant on dry, rocky slopes while Engelmann spruce was common along the canyon bottoms, moist areas and in old growth lodgepole pine stands over 150 years of age. Above 7800 feet lodgepole stands were replaced by mixtures of white-bark pine, subalpine fir and Engelmann spruce. Engelmann spruce is the most abundant on the higher elevation sites followed by white-bark pine. Subalpine fir occurred most commonly in the lower portion of the subalpine area. It occurred in mixed stands and did not exceed

15 to 30 percent of the stand. Age structure varied greatly with stands 15 to 20 years of age associated with growths 75 to 100 years of age and with 200 to 300 year old stands. Of the forested area below 7800 feet, 10 percent was less than 50 years of age, 50 percent between 50 and 120 years with the remaining 40 percent between 120 to 300 years. Additionally 10 percent is shown as logged and 24 percent as burned. The logged area represents about 42,000 acres primarily on lower elevation slopes and is really part of the forested environment. The areas shown as burned are more than likely forested area that have burned during the last 35 to 40 years and represent about 138,000 acres. It was estimated that 70 percent of the forest had been burned over between 1780 and 1900. While some stands show an uneven age structure the majority are even aged suggesting stand replacement fires in the lodgepole type. Most lodgepole pine stands contained heavy accumulations of fuel and there was no indication that open, underburned sites were common.

Along the major rivers such as the Yellowstone was a zone of cottonwood forest. This type was principally made up of cottonwood with minor amounts of other hardwood species such as box elder and green ash. This mixture became more important in the eastern portion of Montana and on into the Dakotas. Species composition listed below is for individual species and does not represent cover types as presented in previous Climatic Sections.

Douglas-fir	19 %
Lodgepole pine	50 %
Ponderosa pine	0.1%
Engelmann spruce	17 %
Subalpine fir	6 %
Limber pine	7 %
Aspen & cottonwood	0.6%

Woodland Type - This type occurred on the fringe of the forested area and represented shrubby open grown stands of limber pine, Douglas-fir, aspen or on occasion lodgepole pine. On moister environments these types represented the encroachment of the forested type unto grasslands and with the return of the next fire the site may revert to grassland. These sites were generally stocked with young aged stands. On drier sites particularly those stocked with limber pine or in some cases Douglas-fir, fire occurred as an underburn and the type was maintained indefinitely. About 4 percent of the area was occupied by these conditions.

Nonforested Area (73 percent)

Grasslands - Grasslands were found on about 42 percent of the area composed of 4 major types.

Wheatgrass-fescue - This is the major grassland type in Climatic Section 14 on all but the eastern portion. Vegetative structure is similar to that presented in

Climatic Section 13.

Sagebrush-grass - This type is also described in Climatic Section 13. The type is limited and confined primarily to the upper Yellowstone River, the Big Timber area and northwest of the Crazy Mountains.

Wheatgrass-needleandthread - This type is confined to the eastern portion of the area with species more common in eastern Montana more important. The grass is relatively short varying from open to somewhat dense structure. Western wheatgrass, blue grama and needleandthread grass are the dominant species. Other species which may be present are bluebunch wheatgrass, bluestem, fringed sage, sedge, hairy goldaster, snakeweed and junegrass.

Alpine grassland - This community is found on a true alpine type above timberline. It is similar to the description found in Climatic Section 13. While these communities appear to be dominated by grasses, forbs play an important role in stand composition.

Other Areas - The remaining portion of the area is covered by a mixture of types such as rock, 28 percent, and lakes and streams, 3 percent.

CLIMATIC SECTION 15 - MUSSELHELL

Climatic Section 15 occupies the central portion of Montana from Great Falls, Helena area east to the Musselshell River. Forests included are portions of the Helena and Lewis and Clark. Portions of Powell, Jefferson, Gallatin, Yellowstone, Cascade, Chouteau, Meagher, Lewis and Clark, Broadwater, Judith Basin, Wheatland, Fergus, Petroleum, Musselshell and Golden Valley counties are included. Forest Service ownership is confined principally to the scattered small mountain ranges including a portion of the Big Belts, Little Belts, Highwoods, Big Snowy, Little Snow and Moccasin Ranges. Between these ranges are extensive areas of grass type primarily in non Forest Service ownership.

Forest communities are confined to the prominent mountain ranges and the Missouri River Breaks. Limestone derived soils play a significant role in the location of some plant communities within the area. About 20 percent of the Climatic Section is potentially forested with the remaining grassland. Weather conditions are typical of the continental climate east of the Continental Divide. Winter conditions are not quite as severe as Climatic Section 17 and forests are found on slightly lower elevations. Precipitation ranges from a high of about 40 inches on the highest peaks to 10-14 inches for the grass types. Temperature extremes are common during the winter months with high wind common throughout the year.

On mountainous slopes all rock types can be found with most showing evidence of glacial activity. Slopes are gentle to steep. In the foothills rock types are a mixture of volcanics, quartzite, argillite, granitic, limestone and sandstone. In most cases these are frost churned with only minor glacial activity. Slopes are gentle to moderate. In the plains soft sedimentaries are the major rock type most impacted by stream erosion. Slopes are gentle.

As in other portions of the state the discovery of gold attracted numerous people to this portion of the state in the 1860's. Activity here and in the Big and Little Belt Mountains caused a significant impact on the forest communities by the 1890's. The establishment of ranching and agricultural development between 1880's and 1900 also had a significant impact on all the forested areas. Ayres in his report indicated that 25 percent of the forested area was cut. The 1930's survey showed about 3 percent however this survey did not include the Neihart area where much of the harvest occurred. Chouteau and Judith Basin Counties had about 6 percent cutover by the 1930's.

Forested Types (20 percent)

Specific information on forest conditions is available for Cascade, Chouteau, Fergus and Judith Basin Counties which includes the Highwoods, Big Snowy, and the north east half of the Little Belt Mountains. More general information is available for the remaining portion of the Little Belt area. To date no early survey work has been found for the Big Belt or MacDonald Pass areas. Field studies conducted during 1992 and proposed for 1993 will provide some information on the historical structure of these sites.

Cascade County - Approximately 19 percent of the county is forested of which about 55 percent is in Forest Service ownership. Only 4 percent of the area is shown as cut which seems low when the early mining activity is considered. There is in addition 11 percent

that is shown as nonstocked which could reflect some of the early cutting. Ponderosa pine comprised about 18 percent of the commercial forest area of which 31 percent was under 40 years of age. Only 5 percent may have met the old growth definition. Douglas-fir represented about 34 percent of the area. Old growth may have accounted for 3 percent of the stands with 35 percent less than 40 years of age. The most common species was lodgepole pine found on 47 percent of the commercial acres. Over 6 percent of the type was old enough to be considered potential old growth and only 21 percent less than 40 years of age. Less than one percent of the area contained Engelmann spruce which was 27 percent less than 40 years of age and about 3 percent may have qualified as old growth.

Chouteau County - Only about 2 percent of the county is in a forested condition with a major portion associated with the Highwood Mountains. This is also where much of the Forest Service ownership is located. The ponderosa pine cover type was found on 22 percent of the forested area none of which was in the Highwoods. About 89 percent was less than 40 years of age which suggests a major expansion of the type or heavy harvesting that was not recognized by the inventory. Much of this type would have been adjacent to the Missouri River where steep slopes may have resulted in more frequent stand replacement type of fires. The Douglas-fir type represented about a third of the forested area with 96 percent less than 40 years of age. Lodgepole pine made up the remaining 44 percent with 98 percent less than 40 years of age. Both of these types would have been associated with the Highwood Mountains and may reflect the frequent prairie fires that swept through the area. None of the stands in the county were old enough to qualify for old growth.

Fergus County - About 15 percent of the county was forested with Forest Service ownership found on the Big and Little Snowy Mountains. About 82 percent of the forested area was ponderosa pine of which about a third was shown as pine savanna type. About 83 percent was less than 40 years of age and about 3 percent old growth which represents a very young age structure for ponderosa pine. Douglas-fir and lodgepole pine both made up about 9 percent each of the forested area. About 58 percent of the Douglas-fir type and 69 percent of the lodgepole pine type were less than 40 years of age. None of the Douglas-fir type qualified as old growth but about 2 percent of the lodgepole pine type did meet the age criteria. A trace of Engelmann spruce also occurred in the County.

Judith Basin - This county is in the heart of Climatic Section 15 and includes the northeast portion of the Little Belt Mountain. While entry to the Little Belts occurred very early the northeast portion was less affected because of the lack of major mining activity. About 26 percent of the county is forested of which a significant portion is Forest Service ownership. Ponderosa pine is of moderate importance occupying about 13 percent of the forested area. Stands were young with only 7 percent classed as old growth and 79 percent less than 40 years of age. It is difficult to determine at this time if this structure was natural or the result of early harvest overlooked by the 1930 inventory. Douglas-fir is the most common cover type representing 44 percent of the forested area. These stands are also young aged with 60 percent less than 40 years of age however 20 percent was classed as old growth which is unusually high for this type. Lodgepole pine is a close second in area occurring on 42 percent of the area. Its age structure is older than normal with only 49 percent in the less than 40 year age category and about 16 percent meeting old growth definitions. These conditions represent the oldest age structure for the type that was identified by the 1930's inventory. A minor amount of Engelmann spruce occurred primarily in a mature to old growth condition.

Black cottonwood was common outside Forest Service holdings in riparian areas and made up a minor percent of the forested area. Stands were about evenly split between sawtimber and smaller sized material.

Non forest Types (80 percent)

Grasslands - Four major grass types were associated with this Climatic Section.

Wheatgrasses-needleandthread-green needlegrass - This type represents the major portion of the grasslands within this Climatic Section. On the moister sites with precipitation of about 15-19 inches rough fescue, Idaho fescue and bluebunch wheatgrass are the most common species. On clayey portions of this type bluebunch wheatgrass becomes more important. On sites with less than 14 inches of precipitation bluebunch wheatgrass, needleandthread and prairie junegrass are the most common species. Big sagebrush may be found on all portions of the type.

Wheatgrass-needleandthread-grama - This type is more common to the east of the Climatic Section. Precipitation ranges about 10-14 inches and the major species are bluebunch wheatgrass, western and thickspike wheatgrass and needleandthread. Both big and silver sagebrush may be present. On clayey portions of the type western and thickspike wheatgrass are dominant and silver sage may be absent.

Sagebrush-grass - A small area of this type was found around Winnett. Major vegetation consisted of western and thickspike wheatgrass, bluebunch wheatgrass and green needlegrass. Big sagebrush was a common species also.

Wheatgrass-fescue - A minor amount of this type was found adjacent to the isolated mountains within the Climatic Section. Rough fescue, Idaho fescue and bluebunch wheatgrass were major components.

TABLE 11 - PERCENT ACRES BY AGE CLASS BY COVER TYPE FOR CLIMATIC SECTION 15
Forest Service Acres** Only

COVER TYPE	NON STOCKED	SEEDINGS & SAPLINGS 1-40 YRS	POLES 41-60 YRS	IMMATURE 61-100 YRS	MATURE 101-VAR.YRS	POTENTIAL OLD GROWTH 121+*YRS
Ponderosa P	9.4	71.7	9.2	3.0	2.6	4.0
Douglas-Fir Engelmann spruce	12.2	54.2	9.5	4.8	5.2	13.2
Lodgepole P	0.8	63.6	10.2	12.3	3.2	9.9
Avg for Climatic A.	11.2	52.1	13.5	11.0	9.6	9.0
	10.9	59.3	10.8	6.4	2.2	10.4

** This data represents only the eastern half of the Climatic Section. Stands in the Big Belts and MacDonald Pass area contained older aged conditions particularly for ponderosa pine however specific information is not currently available for this portion.

CLIMATIC SECTION 16 - ROCKY MOUNTAIN FRONT

Climatic Section 16 is situated east of the Continental Divide from the Canadian border south to the Missouri River. The eastern boundary follows the edge of the foothills west of Interstate 15. It covers a portion of the Lewis and Clark Forest and portions of Toole, Glacier, Pondera, Teton, Lewis and Clark and Cascade Counties.

Forests cover about 14 percent of the area with the remaining in grassland communities. Precipitation reaches a high of 120 inches along the Continental Divide to a low of 12 inches along the eastern boundary. Weather patterns are marked by extremes with severe chinook winds and dramatic fluctuations of winter temperatures. Red belt conditions associated with these weather patterns is common on exposed slopes. Some of the most extensive aspen groves in the state along with large stands of limber pine are common along the lower skirts of the mountains.

A major impact on the forest communities occurred about 1892 with the construction of the Great Northern Railway. Not only were significant amounts of timber harvested to construct this railway but also a number of fires started by this activity burned a major area in the vicinity of Summit and Essex.

Intensive surveys are limited however a portion was covered during the survey for the Lewis and Clark Reserve in the 1890's.

Forested Types

Douglas-fir - The type was generally found below 6500 feet and described as containing small and very defective trees with some individuals up to 30 inches in diameter. The type occupied a minor portion of the area and much of it had been burned during the 1889 fire year. Stand structure appears to have been similar to Climatic Section 15.

Engelmann Spruce - This was a limited type and probably occupied less than 10 percent of the area however it represented most of the mature stands in the area. This type was found in the canyon bottoms and some moist benches with some stands about 200 years of age. Most of the older stands were found in Swift Current and St. Mary's drainages.

Lodgepole pine - The type was the major forest vegetation type and was found occupying the upper slopes. Age structure was similar to Climatic Section 15 with stands dominated by trees less than 40 years of age and only limited old growth.

Foothill savanna - A significant portion of the area is occupied by open stands of Douglas-fir or limber pine and/or aspen. Most of these sites showed repeated fire impact.

Black cottonwood - This type was common along the major drainages and was primarily composed of pole aged stands.

Non-forested Area

Grasslands - The grasslands in this Climatic Section are represented by three major types with variations in species dominance dependent on precipitation and soil type.

Wheatgrass-fescue - This is a common type in western Montana and in the northern portion of the state. This location represents its most eastern occurrence. On precipitation sites of from 20-24 inches rough fescue, needlegrasses and mountain brome are the most common species. This type also includes areas of shrub growth. These sites were normally associated with riparian areas or seeps which were common along the lower foothills on the eastern portion of the Climatic Section. Willows and shrubby aspen were common species. Downslope in the 15-19 inch zone, community structure is dominated by rough fescue, Idaho fescue and bluebunch wheatgrass. The drier portions which range from 10-14 inches of precipitation were mainly bluebunch wheatgrass, needleandthread and prairie junegrass. On all these sites big sagebrush may be found.

Needleandthread-wheatgrass-grama - This type is primarily confined to the north central and north eastern portions of the state. Major species are needleandthread, western and thickspiked wheatgrass and green needlegrass. Silver sagebrush could also be present.

Wheatgrasses-needleandthread-green needlegrass - The major area for this type is in central and south east portions of the state. Most common species included green needlegrass, western and thickspike wheatgrass and bluebunch wheatgrass. This type tends to be associated with clayey soils and on areas of more silty soils needleandthread is the most common species along with the wheatgrasses. While silver sage may be on the silty portions of the type it apparently was limited elsewhere.

INCOMPLETE SECTIONS

The following areas are principally grassland types that have not been thoroughly investigated. Some preliminary information on general cover types is presented with more complete information to be available in subsequent drafts.

CLIMATIC SECTION 17 - MISSOURI

This section includes all or portions of Blaine, Hill, Liberty, Phillips, Pondera, Teton, Toole, Petroleum, Cascade, Chouteau and Fergus. About 3.5 percent were forested with 0.5 percent noncommercial, 0.3 percent hardwood bottoms.

CLIMATIC SECTION 18 - FORT PECK

While some boundary adjustments may be made the Section currently includes Rosebud, Treasure, Yellowstone, Blaine, Daniels, Dawson, Musselshell, Garfield, Petroleum, McCone, Phillips, Prairie, Richland, Roosevelt, and Valley. Only about 1.3 percent of the area is in forested conditions.

CLIMATIC SECTION 19 - TONGUE-POWDER

This is a large area in the southeast corner of Montana which includes Big Horn, Treasure, Yellowstone, Carbon, Carter, Dawson, Musselshell, Custer, Fallon, Golden Valley, Powder River, Prairie, Rosebud, Stillwater, Wheatland, and Wibaux counties. A little over 5.3 percent of the Section is forested with about 1 percent non commercial and 0.3 percent hardwood bottoms.

CLIMATIC SECTION 22 - LITTLE MUDDY

Much of this section is in the Dakotas and Canada with a small area in the northeast section of the state. It includes portions of Daniels, Dawson, Richland, Roosevelt, and Sheridan. This area is almost devoid of forested cover types with only 0.25 percent present as hardwood bottoms.

FOREST COMPOSITION FOR EASTERN MONTANA

SPECIES	SOUTH CENTRAL	NORTHERN	SOUTHERN
PP	3.8	8.1	23.0
L	T	-	-
DF	45.3	17.7	26.1
AF	1.6	3.6	1.5
ES	16.5	17.8	14.3
LP	29.5	8.6	26.5
WBP	2.6	2.4	4.8
ASPEN-COTTONWOOD	0.7	41.8	3.8
VOLUME/ACRE	8.6	4.4	7.9

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